

## PATENT COOPERATION TREATY

PCT

REC'D 16 JAN 2006

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY  
(Chapter II of the Patent Cooperation Treaty)

PCT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2041322PC/or	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/FI2004/000589	International filing date (day/month/year) 06-10-2004	Priority date (day/month/year) 06-10-2003
International Patent Classification (IPC) or national classification and IPC See Supplemental Box		
Applicant Metso Paper, Inc. et al		

- This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 4 sheets, including this cover sheet.
- This report is also accompanied by ANNEXES, comprising:
  - ☒ (sent to the applicant and to the International Bureau) a total of 4 sheets, as follows:
    - ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
    - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
  - ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) \_\_\_\_\_, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

- |                                     |              |   |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the report   |
| <input type="checkbox"/>            | Box No. II   | Priority  |
| <input type="checkbox"/>            | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention  |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited   |
| <input type="checkbox"/>            | Box No. VII  | Certain defects in the international application  |
| <input type="checkbox"/>            | Box No. VIII | Certain observations on the international application   |

Date of submission of the demand  04-05-2005	Date of completion of this report  20-12-2005
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer  Fredrik Andersson / MRO Telephone No. +46 8 782 25 00

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

International application No.

PCT/FI2004/000589

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Cover sheet

**INTERNATIONAL PATENT CLASSIFICATION (IPC) :**

**B02C 7/12 (2006.01)**

**D21B 1/14 (2006.01)**

**D21D 1/30 (2006.01)**

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI2004/000589

Box No. I Basis of the report

1. With regard to the language, this report is based on:



the international application in the language in which it was filed

a translation of the international application into \_\_\_\_\_,  
which is the language of a translation furnished for the purposes of:

international search (Rules 12.3(a) and 23.1(b))



publication of the international application (Rule 12.4(a))



international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

the international application as originally filed/furnished



the description:

pages 1 - 18

as originally filed/furnished

pages\*

received by this Authority on \_\_\_\_\_

pages\*

received by this Authority on \_\_\_\_\_



the claims:

pages \_\_\_\_\_

as originally filed/furnished

pages\*

as amended (together with any statement) under Article 19

pages\* 19 - 22received by this Authority on 04.05.2005

pages\*

received by this Authority on \_\_\_\_\_



the drawings:

pages 1 - 10

as originally filed/furnished

pages\*

received by this Authority on \_\_\_\_\_

pages\*

received by this Authority on \_\_\_\_\_



a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

the description, pages \_\_\_\_\_



the claims, Nos. \_\_\_\_\_



the drawings, sheets/figs \_\_\_\_\_

the sequence listing (*specify*): \_\_\_\_\_any table(s) related to the sequence listing (*specify*): \_\_\_\_\_4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

the description, pages \_\_\_\_\_



the claims, Nos. \_\_\_\_\_



the drawings, sheets/figs \_\_\_\_\_

the sequence listing (*specify*): \_\_\_\_\_any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI2004/000589

**Box No. V** Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims	<u>1-28</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-28</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-28</u>	YES
	Claims		NO

## 2. Citations and explanations (Rule 70.7)

## Documents cited in the International Search Report:

D1: US 5467931  
D2: US 4023737  
D3: US 5893525  
D4: SE 513807  
D5: US 5476228  
D6: US 6607153

Amended claims 1-28 have been filed on 4 May 2005.

The invention defined in new claims 1-28 is not disclosed by any of the cited documents.

The cited prior art does not give any indication that would lead a person skilled in the art to the claimed refining surface and blade segment for a refiner. Therefore, the claimed invention is not obvious to a person skilled in the art.

Accordingly, the invention defined in new claims 1-28 is novel and is considered to involve an inventive step.

The invention is industrially applicable.

## CLAIMS (Amended on 3 May 2005)

1. A refining surface for a refiner intended for defibrating lignocellulose-containing material, the refiner comprising at least two refining surfaces (1, 2) arranged coaxially relative to each other, at least one of which refining surfaces (1, 2) is arranged to rotate around a shaft (4), and between which refining surfaces (1, 2) the material to be defibrated is fed, and which refining surface (1, 2) comprises first bars (12) extending from the inner circumference of the refining surface (1, 2) to the outer circumference of the refining surface (1, 2) and between them first grooves (13), and the upper surfaces (18) of which first bars (12) further comprise second grooves (15) connecting said first grooves (13), and between which second grooves (15) there are second bars (14),

**characterized** in that

the second bars (14) are narrower than the first bars (12) and the width of the second bars (14) is 1 to 3 mm.

2. A refining surface as claimed in claim 1, **characterized** in that the average width of the first bar (12) is 2.5- to 40-fold in respect of the combined, average width of the second bar (14) and the second groove (15).

3. A refining surface as claimed in claim 1 or 2, **characterized** in that the total area of the refining zones of the refining surface (1, 2) formed of the second bars (14) and the second grooves (15) is 60 to 90% of the total area of the refining surface (1, 2).

4. A refining surface as claimed in claim 3, **characterized** in that the total area of the refining zones of the refining surface (1, 2) formed of the second bars (14) and the second grooves (15) is 70 to 80% of the total area of the refining surface (1, 2).

5. A refining surface as claimed in any one of the preceding claims, **characterized** in that the width of the first bars (12) is 15 to 80 mm, the width of the first grooves (13) 5 to 40 mm and the depth of the first grooves (13) 10 to 40 mm.

6. A refining surface as claimed in any one of the preceding claims, **characterized** in that the first bars (12) and/or the first grooves (13) have a varying width and/or the first grooves (13) have a varying depth in the direction of travel of said bars (12) or grooves (13).

7. A refining surface as claimed in any one of the preceding claims, **characterized** in that the first grooves (13) are pumping on the feed side of the fibrous material to be refined and retentive on the discharge side of the refined material.

5           8. A refining surface as claimed in any one of the preceding claims, **characterized** in that the width of the second grooves (15) is 1 to 3 mm and the depth of the second grooves (15) 3 to 5 mm.

          9. A refining surface as claimed in any one of the preceding claims, **characterized** in that the second bars (14) and/or the second grooves (15) have a varying width and/or the second grooves (15) have a varying depth in the direction of travel of said bars (14) or grooves (15).

10           10. A refining surface as claimed in any one of the preceding claims, **characterized** in that said second bars (14) and second grooves (15) are arranged on the upper surface of the first bars (12) so that they form an angle of 5 to 30° to the radius of the refining surface (1, 2).

15           11. A refining surface as claimed in any one of the preceding claims, **characterized** in that the number of the second bars (14) of the refining surface zone (16) closest to the feed of the material to be refined is smaller than the number of the second bars (14) closest to the discharge of the refined material, and that the width of the second grooves (15) between the second bars (14) of the zone of the refining surface (1, 2) closest to the feed of the material to be refined is approximately in accordance with the upper limit of the variation range of the width of the grooves (15), and that the width of the second grooves (15) between the second bars (14) closest to the discharge of the refined material is approximately in accordance with the lower limit of the variation range of the width of the grooves (15).

20           12. A refining surface as claimed in claim 11, **characterized** in that in the radial direction of the refining surface (1, 2), the depth of the second groove (15) in each refining surface zone (16) of the refining surface (1, 2) is greater at the beginning of the zone (16) than at the end of the zone (16).

30           13. A refining surface as claimed in claim 12, **characterized** in that on the bottom of the second groove (15) there is a step at the beginning of each zone (16) for hindering the material to be refined from flowing backwards.

35           14. A refining surface as claimed in any one of the preceding claims, **characterized** in that the refining surface (1) is the refining surface (1)

of a rotor (3) of the refiner, being provided with at least one foil (17), which, when the rotor (3) rotates in the pumping direction, is arranged to produce a lifting force to intensify the mixing of fibres and water, and which foil (17), when the rotor (3) rotates in the non-pumping direction, is arranged to cause a push force to intensify the pumping effect and the passing through of the fibrous material.

15. A refining surface as claimed in claim 14, **characterized** in that the foil (17) is arranged on the bottom of the first groove (13).

16. A refining surface as claimed in claim 14 or 15, **characterized** in that the length of the foil (17) is 30 to 80 mm, preferably 50 to 60mm, in the transverse direction of the first groove (13).

17. A refining surface as claimed in any one of claims 1 to 16, **characterized** in that the first bars (12) extend substantially in the linearly outward direction over the refining surface (1, 2).

18. A refining surface as claimed in any one of claims 1 to 17, **characterized** in that the first bars (12) extend in an arc-shaped manner outward over the refining surface (1, 2).

19. A blade segment for a refiner intended for defibrating lignocellulose-containing material, the refiner comprising at least two refining surfaces (1, 2) arranged coaxially relative to each other, at least one of which refining surfaces (1, 2) is arranged to rotate around a shaft (4), and between which refining surfaces (1, 2) the material to be defibrated is fed, and which blade segment can be arranged to form at least a part of at least one refining surface (1, 2), and which blade segment comprises first bars (12) extending from the inner circumference of the refining surface (1, 2) to the outer circumference of the refining surface (1, 2) and between them first grooves (13), and the upper surfaces (18) of which first bars (12) further comprise second grooves (15) connecting said first grooves (13), and between which second grooves (15) there are second bars (14),

**characterized** in that

the second bars (14) are narrower than the first bars (12) and the width of the second bars (14) is 1 to 3 mm.

20. A blade segment as claimed in claim 19, **characterized** in that the average width of the first bar (12) is 2.5- to 40-fold in respect of the combined, average width of the second bar (14) and the second groove (15).

21. A blade segment as claimed in claim 19 or 20, **characterized** in that the total area of the refining zones of the refining surface (1, 2) formed of the second bars (14) and the second grooves (15) is 60 to 90% of the total area of the refining surface (1, 2).

5 22. A blade segment as claimed in claim 21, **characterized** in that the total area of the refining zones of the refining surface (1, 2) formed of the second bars (14) and the second grooves (15) is 70 to 80% of the total area of the refining surface (1, 2).

10 23. A blade segment as claimed in any one of claims 19 to 22, **characterized** in that the width of the first bars (12) is 15 to 80 mm, the width of the first grooves (13) 5 to 40 mm and the depth of the first grooves (13) 10 to 40 mm.

15 24. A blade segment as claimed in any one of claims 19 to 23, **characterized** in that the first bars (12) and/or the first grooves (13) have a varying width and/or the first grooves (13) have a varying depth in the direction of travel of said bars (12) or grooves (13).

20 25. A blade segment as claimed in any one of claims 19 to 24, **characterized** in that the first grooves (13) are pumping on the feed side of the fibrous material to be refined and retentive on the discharge side of the refined material.

26. A blade segment as claimed in any one of claims 19 to 25, **characterized** in that the width of the second grooves (15) is 1 to 3 mm and the depth of the second grooves (15) 3 to 5 mm.

25 27. A blade segment as claimed in any one of claims 19 to 26, **characterized** in that the second bars (14) and/or the second grooves (15) have a varying width and/or the second grooves (15) have a varying depth in the direction of travel of said bars (14) or grooves (15).

30 28. A blade segment as claimed in any one of claims 19 to 27, **characterized** in that said second bars (14) and second grooves (15) are arranged on the upper surface of the first bars (12) so that they form an angle of about 5 to 30° to the radius of the refining surface (1, 2).